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ABSTRACT

Management Information Systems are a successful reality at a vast and increasing number of higher educational institutions. This paper examines the need for and justification of the existence of management information systems and explores the various uses of such systems at all types of higher education related organizations with emphasis on the individual institution. This leads to the compiling of a directory of the various programs, models, and software packages available explicitly for higher education management needs. Each product listed contains its source and various references, so that the reader may either directly contact the source organization or simply read further concerning any of the listed programs. (Author/JMF)

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HIGHER EDUCATION AND MANAGEMENT INFORMATION SYSTEMS

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University of Kentucky

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U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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HIGHER EDUCATION AND MANAGEMENT INFORMATION SYSTEMS

The Need for Management Information Systems in Higher Education

The phenomenal development in not only magnitude but also intricateness of higher education has drawn attention to the necessity for systematic accumulation and subsequent employment of information in the administration of universities, colleges, and state-wide governing and/or planning systems of higher education.

Promoting the utilization of systematic information in the decision-making processes of higher education administrators have recently been the attempts to avoid what David Riesman (1973) termed the 'collision course of higher education.' Riesman described his famous 'collision course' as the trend of higher education toward increasing that which it provides to more diverse constituencies while simultaneously the tax-payer, who is actually the beneficiary of the greater diversity in program availability, is becoming increasingly disenchanted. Specifically, the growing costs of maintaining already existing programs, the manpower demands for new and expanded programs of study, until very recently the vast increases annually in numbers of students being enrolled, the rising demands for improved and additional services, and the continuing and necessary effort to improve quality in all aspects of higher education have served as factors contributing to higher education being an increasing tax burden on society.

Concentrically, the taxpaying public is becoming increasingly more reluctant to provide the needed revenue without express legitimation and justification for the rising costs. Thus, so that the aforementioned increasing budgets may be justified, utilization of systematically stored and selectively retrieved management-valued data has become an accepted and, in fact, essential practice in the decision-making process of higher education administration.

And yet, justification of expenditures and responding to the demands for budgetary information are not the only reasons for the existence of management information systems on today's campuses. College and university administrators are more frequently discovering that they are expected to answer to a wide and varied constituency [from a more highly informed, less apathetic student body to a demandingly precise planning agency/commission] relative to the identification and explanation of institutional outcomes, to the allocation of resources, and to the utilization of the financial, physical, and intellectual resources available on their respective campus. To do this requires relevant, current, and accurate feedback information (Dearing, 1972). This information, for maximum applicability, should be comprehensive in nature, program oriented, and standardized in form and basis thus allowing for possible/probable comparison (Haight & Romney, 1975). Thus, the information can be used to aid in the decision-making process, to help provide for a far more efficient, productive, and quality operation, and to

predict or at least forsee future trends within the respective institutions therefore allowing more accurate and meaningful short-range and long-range planning to take place.

Management Information Systems at All Levels of Higher Education

Throughout the above, reference to the need for management information systems has been generally made at the intra-institutional [within college/university] level, yet when considering the entire area that higher education encompasses, it is obvious that numerous needs exist which justify the development, implementation, and use of management information systems at all levels of higher education. Justifiably, it is agreed that without relevant, systematic information regarding the operation of his/her institution, the administrator might probably misspend scarce resources on inefficient or unneeded programs. Yet if that administrator would be exposed to adequate intra-institutional information comparing status with locally established standards yet lack the benefit of comparable data from similar institutions, a very foundation for the evaluation of his/her own institution's efficiency of operation is wanting thus assuring the administrator's decisions to be made in isolation and to again perchance reflect inefficiency and waste (Smith, 1973).

To insure adequate inter-institutional information availability and allow sensible coordination of effort and judicious allocation of funds to take place, state-level planning/governing agencies require their own

management information systems containing a bank of comparable data from each institution under their authorization (see Abbott, 1974; Millett, 1972; and Wing, 1972). It is still the case however, that many institutions and state-wide agencies are restrained by the lack of suitable data and systems for collection, organization, analyzation, and distribution of information in an efficiently employable format (Huckfeldt, 1974).

To be certain that progress is being achieved at the inter-institutional and state-wide level, there must continue to be development of information systems which collect needed data in standardized form from the institutions being served. This information both at the institutional level and at the state-wide level should be computer-readable for more ease of handling and processing. Following its collection, the data should be organized in a logical manner, be analyzed with specific goals in mind, and should then be distributed back to the contributing institutions without unnecessary cost or duplication of effort (Meincke, 1974).

In an effort to help insure the successful development of such a system, various compacts, associations, and enterprises have engaged themselves in designing, developing, and making available assorted models and programs [see Appendix A for a list of sources, Appendix B for programs and software, and Appendix C for further references to the programs and models listed]. Although many of these 'pre-developed' data programs may frequently require changes to fit available information, in many ways they serve as models for developing basic institutional data bases and for

identifying and specifying the manner and detail in which the information should be collected.

An examination of Perkin's (1972) developmental systems levels of higher education and their respective information needs reveals that the institutions and the state-level planning/governing agencies are not the only levels which require their own management information systems. Retional compacts are also developing their own information systems for effective evaluation of services and avoidance of replicating extravagant programs in adjacent areas of their particular regions (Frondizi, 1972). Andrews (1972) points out the foundation influence on higher education and their systems approach in granting financial awards and research grants to competing institutions. The federal government maintains its own management information system primarily for the efficient allocation of federal research grants and resource financing along with affirmative action guidelines, etc. (Carlson, Farmer, & Stanton, 1973; Cohen, 1972); plus the added existence of management information systems belonging to various national and international associations, foundations, and organizations which will continue to play a tremendously large and significant role in the direction and destiny of higher education now and in the future (Coombs, 1972; also see Keefer, 1974).

But to understand more thoroughly the status of management information systems at all levels of higher education and the goals which should be achieved via the existence and use of these systems, it will be necessary to return to the institutional level and observe their usage and purpose.

The Individual Institution and Management Information Systems

Although individual colleges and universities differ tremendously from each other in size, mission, complexity, and philosophy, they are all somewhat similar administratively and share common information needs which conform to Anthony's (1965) and Sheehan's (1972)* three management function/activity/information levels: information for strategic planning [forecast reports], information for management control [analytic reports], and information for operational control [operating reports].

The first, or highest, level of the above hierarchy involves information which is used in developing sophisticated plans, policies, and in the formulation of strategic decisions, the results of which are of major consequence in determining the direction of the institution. The data at this level is quite often simulated into actual aspects of institutional operation which in essence focuses attention upon the interrelationship between the various facets of the collegial environment. These reports are aggregative in nature and are usually delivered to the presidents, deans, department chairmen, or directors on an irregular or, more specifically, on a need basis. Several examples of strategic planning concerns include: 1] future tuition increases, 2] acquiring new facilities, 3] enrollment forecasts, 4] initiating or deleting degree programs, 5] changing organizational structure, 6] budgeting/financially allocating

*Sheehan's three levels of reports are placed within the brackets.

funds to the various colleges/departments, and 7] examining and redefining the institution's mission, philosophy, and goals (Baldridge, 1971).

The second level, or that of management control, involves information which is used for the control of various administrative policies and decisions usually, but not always, relating to budgeting. This management control information appears far more regularly than the aforementioned strategic planning information and is delivered to upper- and middle-level administrators. Some examples of management control concerns include: 1] formulating line-item budgets, 2] promotion of students, 3] proper and consistent resource utilization, 4] changing curricula, 5] student enrollment patterns, 6] control of faculty and staff levels, 7] budget control and organizational inter-relationships, and 8] faculty/personnel evaluation (Millett, 1974).

The third, or lowest, level of informational need revolves around operational control. This level deals with the basic control of specific tasks being executed resulting in immediate, daily, or periodic action. Though sometimes described as merely clerical in nature, operational control decisions are ones made by all and thus witness information being delivered to almost all personnel from the bottom-line supervisors to the top-line administrators. More explicitly, information for operational control is furnished to: 1] registrars--data for scheduling courses, student admissions, grades, and transcripts, degrees and graduation; 2] librarians--circulation, storage, cataloguing, and purchasing;

3] personnel managers--payroll, applicant data, updated personnel data, staff benefits, and regular assignment and scheduling of employees; 4] facilities managers--scheduling of buildings and rooms, article inventory of buildings and grounds; 5] department chairmen--faculty activity and workload information, class/course assignment; 6] research directors--records on proposals, grants, contracts, and current status of on-going research; 7] alumni and placement officers--job interviews, corporation openings, visitations, alumni gifts and donations, alumni achievements, positions, and publications; 8] financial managers--expenditure accounting, budget accounting, depreciation accounting, student loans and student aid accounting; 9] auxiliary managers--food services, housing, physical plant, institutional research, maintenance, book store, transportation, and many, many others (Fresh, 1975; Levine, 1975; T. D. R. Martin, 1974; Shelton, 1975; Thomas, 1975).

Much work has been done in computerizing information systems at the operational controls level. Scarcely an institution exists today that does not computerize student records, payroll, library circulation, inventory, registration procedures, and other operations level tasks. The end result in the computerization of such tasks is the tremendous increase in efficiency and cost-effectiveness of these operations. Likewise, computerization of information systems on the strategic planning level and the management control level eliminate time-wastage and clerical error and help improve the administration of the institution by providing

systematic, timely and relevant information quickly and efficiently for planning purposes and administrative decision-making (Baughman, 1969).

Schroeder (1975) produced a classification system of institutional functions replete with subdivisions and subfunctions. He identified six main functions--academic, student services, support services, financial, personnel, and facilities--and then largely broke the first three functions into subfunctions: 1] academic--instruction, service, research, libraries, and others; 2] student services--admissions, financial aid, registration, housing, placement, athletics, alumni; 3] support services--computing, plant services, development, auxillary services and enterprises, etc. Schroeder then proceeded to form a matrix similar to one produced by Davis (1974) relating to management information systems in business organizations. So that this matrix may be formed, Schroeder directed the institutional functions to be combined with Anthony's (1965) three management function/activity levels. Thus, a matrix classification scheme appears [see following page] which delineates between the various types of information and the diverse kinds of decisions currently existing within the individual institutions.

Given that these types of information and kinds of decisions exist, it would be beneficial at this point to examine the programs that are portrayed in Appendix B. These programs cover a multiplicity of purposes and meet a variety of needs and may each be positioned within the matrix of information and decisions in its own unique position.

Management Function / Activity Levels

	Strategic Planning	Management Control	Operational Control
Academic	Instruction	Research	Other Academic Services
		Libraries	
		Public Service	
Student Services	Admissions	Placement	Housing
		Registration	Alumni
		Financial Aid	
Support Services	Computing	Development	Auxillary Enterprises
		Plant Services	
Financial	Finance and Accounting		
Personnel	Personnel Services		
Facilities	Maintenance and Expansion Services		

SOURCE: Anthony (1965), Davis (1974), and Schroeder (1975).

Conclusion

A management information system is little more than a specialized information storage and retrieval system. It is, in its most basic form, a collection of data stored in some organized fashion, along with a set of programs or procedures which are used to retrieve whatever useful information is requested from the stored data base, and another set of procedures or programs which treat the data in various ways once the data is retrieved. It must be remembered that in this process, data is and will always be raw material, information will always be the end product. To this basic form is added procedures to periodically update or add to the stored data bank. Though this certainly is, bu no means, a description of a highly computerized, sophisticated, simulation-capable management information system, it amply describes the very basic structure of the management information system and, in fact, the very first manual management information systems which existed not so very long ago (Knapp & Ogilvie, 1973).

Today's more sophisticated management information systems, in addition to the storage of a very broad data base, includes numerous models and computerized programs which are capable of retrieving necessary information instantaneously, displaying this information in meaningful forms to the user, simulating actual aspects of a college or university operation, and treating the data in a number of ways as it would be hypothetically affected by a number of possible alternatives before the decision is

actually made to go with any one of or the 'best' alternative (Levine & Mowbray, 1974). The ultimate objective of the management information system is to provide management with information so that sound decisions may be made and proper alternatives may be implemented.

Tomorrow's management information systems can be speculated upon as to design, appearance, speed, and quantifiable features. Certainly one may foresee an audio-video mechanism on the desks of the institutional executives with instant display of well positioned information and accompanying audio discussion of alternatives with far-ranging simulated effects. Even as the administrator speaks or converses with his peers, the system senses his direction and responds with needed and crucial information and displays alternatives for decision-making purposes.

Should some of these advancements actually take place, they will result in alteration of hardware and software design, but the purpose of the management information system will remain the same for a long while or, in fact, indefinitely. That is, the management information system will continue to allow the administration to make decisions on a more informed, more accurate basis. Obvious it is that no matter how sophisticated the system becomes, it will still remain the servant of man and not make the decision itself but rather supply the needed information and thus allow man to make the soundest of decisions possible (Hammer, 1974).

It is with this in mind that higher education can continue to utilize such systems and support their continued development without fear of lost autonomy. Thus, the future of management information systems in

higher education remains an exciting challenge because these projections should come about, but they can only be achieved through the continuing efforts of today's users.

In 1968, C. W. Churchman published a description of various schools of thought then debating the systems approach. It should be quite clear from the above discussion who the leaders currently are between Churchman's advocates of efficiency, systems tools, and use of science versus his advocates of human values, privacy, and freedoms to be not bound by planning and stipulations. Though it is true that a new breed of moderates believing in the systems approach along with the protection of human privacy and freedoms has since appeared in great numbers, the weight of influence happens to be with the systems people on today's campuses. Yet management information systems must continue to allow institutions their autonomy, their dignity, their freedom of philosophy and direction lest we find the advocates of anti-planning and anti-management information systems gaining ammunition in the on-going debate. The positive contributions must be continued and the progress must be enhanced for management information systems to be totally accepted by all in the world of academe. The responsibility for achieving all of this in the forseeable future rests with today's users within higher education. With constant efforts on the part of all, management information systems can find their rightful place in the support of higher education for now and in the future.

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APPENDIX A

Appendix A

The following list is a collection of organizations, universities, and commissions which have contributed immensely to the advancement of management information systems in higher education (Shoemaker, 1973; Cudnick, 1977). They are alphabeticized according to acronym:

AFMR	American Foundation for Management Research Management Learning Center Hamilton, New York 13346
CAUSE	College and University Systems Exchange 737 Twenty-Ninth Street Boulder, Colorado 80303
CRMS	Center for Research in Management Science Office of Analytical Studies University of California 2288 Fulton Street Berkeley, California 94720
CINCOM	Cincinnati Communication Systems 2181 Victory Parkway Cincinnati, Ohio 45206
HEMI	Higher Education Management Institute 2699 South Bayshore Drive Suite 1000 A Coconut Grove, Florida 33133
MRI	Midwest Research Institute 425 Volker Boulevard Kansas City, Missouri 64110
NACUBO	National Association of College and University Business Officers Suite 510 One Dupont Circle, N. W. Washington, D. C. 20036
NCHEMS/WICHE	National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education Post Office Drawer P Boulder, Colorado 80302

Appendix A

NLHE — National Laboratory for Higher Education
Senior College Division
Mutual Plaza
Durham, North Carolina 27701

SCT — Systems and Computer Technology Corporation
Seven North Five Point Road
West Chester, Pennsylvania 19380

SDL — Systems Dimensions Limited
Systems Research Group
111 Avenue Road
Toronto, Ontario M5R 3J8

Those organizations not known by acronyms:

Project FIND — Data Processing Center
Dartmouth College
Hanover, New Hampshire 03755

Project INFO — Stanford University
Room 10, Encina Hall
Stanford, California 94305

Project TEMPLAN — Temple University
Fred W. Nicolai
Assistant Vice-President for Administration
Philadelphia, Pennsylvania 19122

Education and Economics Systems, Inc
Boulder, Colorado 80302

Honeywell Information Systems, Inc.
200 Smith Street
Waltham, Maine 02154

Informatics, Inc.
21031 Ventura Boulevard
Woodland Hills, California 91364

Peat, Marwick, Mitchell, and Co.
345 Park Avenue
New York, New York 10022

APPENDIX B

Appendix B

The following list is a collection of management information systems models, programs, and software designed primarily or specifically for the needs of higher education. A significant number of analytic tools are available which serve as links between the data and the decision. The list of models below and their brief descriptions attest to the fact that they are not only being used on the intra-institutional level but also by state governments and regional associations for institutional distribution as well as on the national level for data collection and statistical reporting. This collection of programs may not be exhaustive, but it is the first attempt this writer is aware of which endeavors to gather all products together which effect information systems in higher education and have them appear in a singular publication. These products are presented alphabetically according to acronym.

There does exist various general or overall software generally referred to as 'data management systems' designed to prevent each user institution from having to develop intricate programs for various common tasks. Though these are largely file management storage and retrieval systems, they will not be covered in the product section of this directory. The product section refers to specialized models and software available for specific tasks. For a look at listings, ratings, and explanations of the hundreds of software systems available, consult Gepner (1976, 1977a, and 1977b). All three of these references are available in systems libraries everywhere.

Appendix B

AOS - Administration and Organizational System

A product of NLHE, AOS is a very general information storage and retrieval system designed for use at smaller educational institutions with limited or minimal computer hardware (Shoemaker, 1973).

AUPM - Academic Unit Planning Model

A product of the IIPM [Intra-Institutional Planning and Management] Project of NCHEMS, this model helps create structures for academic units, it helps assess demand for such units, and it helps in the identification and allocation of resources in terms of finances, personnel, and equipment needed for the academic units (Miyataki, 1975).

BAMR - Budgeting and Accounting for Manpower Resources

Another product of NCHEMS, the BAMR defines the categories of personnel, assesses the availability of different types of manpower, estimates the distribution of personnel, and defines the range of manpower resources within the institution (Jones & Drews, 1975).

CAM - Cost Analysis Manual

This manual, an off-shoot of CFP, defines the categories of expenditures and the procedures for allocation of costs and distribution of expenditures within an institution (Topping, 1974).

CAMPUS - Comprehensive Analytical Methods for Planning in University Systems

A product of SDL of Ontario, the CAMPUS simulation model is used in planning for efficient resource allocation through the generation of financial reports--whether quarterly, semesterly, annually, or multi-year--in either very general or explicitly detailed form (Judy, 1969; Levine, 1969).

Appendix B

CFP - Cost-Finding Principles

This NCHEMS computer program is designed to aid in developing direct and indirect cost figures of higher education (Magarrell, 1974).

CUP - College and University Planning

A product of AFMR and Colgate University, CUP is a planning process designed for presidents and administrative associates from medium-sized, private liberal arts colleges (Shoemaker, 1973).

DED - Data Element Dictionary

In an effort to help establish uniform definitions of information for storage and retrieval purposes regarding students, staff, facilities, courses, and finance, several DED's have been published and are used in organizing the institution's data base (Thomas, 1970; Welch & Jackson, 1973; Goddard, Martin, & Romney, 1974).

EFM - Enrollment Forecasting Manual

This product of NCHEMS supplies various enrollment forecasting procedures and techniques to higher education practitioners with the needed background in quantitative analysis. These procedures are designed primarily for use on the state-wide agency level (Wing & Tsai, 1972; Wing, 1974).

FAA - Faculty Activity Analysis

Though it is extremely similar to the BAMR, the FAA assesses but one type personnel [faculty], and that in exact detail. Faculty activity categories are established, measurements in average hours per week are made, outcomes are described, and all data is in a format ready for analysis (Romney, 1971; Manning & Romney, 1973; Romney & Manning, 1974; Gamso, Haight, Martin, & Collard, 1975).

Appendix B

FDG - Faculty Data Generator

NCHEMS's accompanying computer package to their FAA, the FDG breaks down faculty assignments for purposes of analyzation by salary, load, rank, instructional level, and so on (Magarrell, 1974).

FICM - Facilities Inventory and Classification Manual

This procedure allows for current inventory practices and standard coding for room use and facilities (Romney, 1972a).

FIND - Forcasting Institutional Needs at Dartmouth

Originally Project FIND at Dartmouth College at Hanover, this flexible management information system is now an institutionally recognized unique system which uses a universal, easy language requiring minimal expertise while serving as a planning tool for estimating results of upcoming policy changes (Chapin, 1974).

FPMM - Facilities Planning and Management Manual

Considerably more complex than the FICM, the FPMM determines the capacity of existing buildings and facilities and establishes needs projections for additional facilities (Dahnke, Jones, Mason, Romney, et al., 1971).

HEFM - Higher Education Finance Manual

This manual, another product of NCHEMS, defines a format for reporting institutional financial data in a comparable manner (Collier, 1972, 1974, 1975).

HELP/PLANTRAN II - Higher Education Long-Range Planning/Planning Translator II

A product of MRI, PLANTRAN II is a long-range planning program designed to analyze data by various means and to linearly project data for up to twelve-year-plus projections (Salmon, et al., 1972).

Appendix B

HEPS - Higher Education Planning System

A product of Education and Economics, Inc., HEPS is a very general computerized system for planning designed to provide data to aid in decision-making relative to such areas as space needs, program loads, and others (Shoemaker, 1973).

ICLM - Induced Course-Load Matrix

The ICLM, a variation of the IWLM [Instructional Work Load Matrix], is a matrix which "displays the load induced in each department by the average student in each field of study" (Haight & Romney, 1975, p. 35). It is a very necessary module on which the RRPM [Resource Requirements Prediction Model] is based (Collard & Haight, 1973).

IEP - Information Exchange Procedures

A comprehensive method of cost comparisons for both intra- and interstate use, IEP provides data for cost analysis of both academic and support programs. NCHEMS, its producer, labels it as a method which eases the process of acquiring and producing comparable data for all involved institutions (R. S. Johnson, 1974; Johnson & Huff, 1975; Myers & Topping, 1975; Renkiewicz & Topping, 1973; Romney, 1972b, 1973).

IQRP - Interactive Query and Report Processor

Developed by IBM, this Installed User Program enables the user to interact mathematically with stored data via free-form commands which are very easy to learn (Movizzo, 1974).

IWLM - Instructional Work Load Matrix

A very unique and interesting procedure, the IWLM serves as a basis for historical costing, cost simulation, and enrollment pattern analysis. This NCHEMS product displays within a matrix the total number of units of each discipline by students in all categorical areas, thus displaying units completed by typical students in specific programs at each level (Haight & Martin, 1975a, 1975b).

Appendix B

JAG - Joint Accounting Group

This report, the joint product of efforts by NACUBO, NCHEMS, and AICPA, is designed to establish definitive categories of higher education revenue/expenditure transactions (Haight & Romney, 1975).

LOCUS - Library of College and University Systems

This product of SCT describes the results of implementing various programs in over eighty universities and colleges, including: TIM, or transaction input module; CR, or course request; CSM, or course schedule maintenance; SCH, or scheduling module; and A/D, or add/drop module (Karabinus & Boris, 1972; Magosin & Baillis, 1974).

MAM - Manpower Accounting Manual

This NCHEMS product details a needed system for classification of personnel in higher education (Minter, 1972).

OASIS - On-Line Administrative Information System

A product of Project INFO at Stanford University, this administrative data management system provides current on-line information to administrators, department chairmen, and directors relative to their decision-making needs (Traver, 1974; Gwynn, 1969; see also McElroy & Payne, 1974).

OMIS - Outcome Measures Identification Study

The OMIS is a product of NCHEMS which identifies various outcome measures that are needed and those that are available (Micek & Arney, 1974; Byers, 1975b; see also Balderston, 1970).

OMPM - Outcome Measures and Procedures Manual

This NCHEMS product describes procedures on data exchange, data collection, and information definition for the various outcome measures which OMIS identified (Byers, 1975a; Haight & Martin, 1975c; Micek, Service, & Lee, 1975).

Appendix B

OSCAR - On-Line Student Course Assignment and Registration

This system, a product of Dartmouth College in Hanover, is one which provides a quick, easy-to-use on-line capability for course assignments and updates to registrars (McGeachie, 1974).

OVMI - Outcome Variables and Measures Inventory

The OVMI lists higher education outcome measures categorized in three major areas. These three categories relate to new knowledge, student growth and community impact (Micek & Wallhaus, 1973).

PCS - Program Classification Structure

This NCHEMS product is a standard structure designed primarily for the identification and categorization of specialized information (Gulko, 1972; Wing & Romney, 1974).

PM - Program Measures

Consisting of six primary categories [resource measures, financial measures, beneficiary group measures, target group measures, activity measures, and outcome measures], this NCHEMS product is designed to support management information systems through complete description (Topping & Miyataki, 1973).

RRPM - Resource Requirements Prediction Model

NCHEMS has designed the RRPM exclusively for intra-institutional use by administrative planners. It is a cost simulation model showing the average cost per student in each area of study, the cost per credit in each department, and so on. It is a valuable tool for institutions to project instructional costs (Clark, et al., 1972, 1973; Collard & Haight, 1973; Gulko & Hussain, 1971).

Appendix B

SAM - Student Attrition Manual

This module is designed to help provide information regarding numbers and percentages of dropouts and reasons for attrition that may lead the institution to assume some form of corrective action (Bower & Myers, 1976).

SEARCH - System for Evaluating Alternative Resource Commitments in Higher Education

A product of Peat, Marwick, Mitchell and Co., SEARCH is a mathematical simulation model primarily designed for remote terminal use connected via network to a central large computer. The model itself projects data linearly up to ten years by yearly intervals (Shoemaker, 1973).

SFM - Student Flow Model

A product of NCHEMS employing transitional probabilities, SFM is designed to not only forecast student flow between subject areas from one term to the next, but, depending upon the validity and reliability of the probabilities, also review and analyze the effect of changing policies in admissions on student types, compare attrition rates in various categories, and examine any particular student group such as female or minority students and their flow through the institution (Gray, 1974; D. Johnson, 1974a,b,c; Lovell, 1971; Martin & Wing, 1973).

SPACE - Space Planning And Cost Estimating

A product of CRMS at the University of California, SPACE is designed to analyze class scheduling patterns and alternatives and consequently measure the impact upon available space resources (Shoemaker, 1973).

SWM - Statewide Measures

Essentially a standardized list of data elements, this NCHEMS product contains definitions of items relevant to statewide planning and management of postsecondary institutions (Allman, McLaughlin, & Wing, 1974, 1975a, 1975b).

Appendix B

SWS - Statewide Structures

This NCHEMS Project set up a manner of classifying and displaying information and creating a filing system for measures designed to improve allocation and utilization of resources (Haight & Romney, 1975).

TEMPLAN -

TEMPLAN, a planning model developed by Temple University, simulates effects on a yearly basis by inputing various trends or assumptions (Shoemaker, 1973).

TOTAL -

This very sophisticated product by CINCOM Systems is designed primarily for use with the day-to-day operations of a university or college. It is an information storage and retrieval system containing elements from diverse sources stored in a standardized format (Shoemaker, 1973; Ehrensberger, 1974).

APPENDIX C

Appendix C

The following is a reference list to the content in both preceding appendices:

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